

UNITED STATES AIR FORCE RESEARCH LABORATORY

Intelligent Agent Feasibility Study Volume 2: Aircraft Mission Capable Parts (MICAP) Process

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FOR THE COMMANDER


THOMAS J. MOORE, Chief
Crew Survivability and Logistics Division
Air Force Research Laboratory

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Research on software agents and agent-based systems has now been underway for more than twenty years. Within the last few years interest in agents and agent-based systems has spread to include the active involvement of the broader commercial software community. In Volume 1 of this study we traced these developments in the academic, commercial, and government arenas. In this volume, Volume 2, we provide an examination of the Mission Capable Parts (MICAP) maintenance process as it is conducted today and outline recommendations for employing agent-based system capabilities to improve the process in the future.				
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PREFACE

This report documents the results of a general survey of the USAF Mission Capable Parts (MICAP) process conducted as part of a logistics research and development program titled *Intelligent Agents as Productivity Aides – Feasibility Study* (contract number F41624-9T-D-5002), managed by the Air Force Research Laboratory, Logistics Sustainment Branch (AFRL/HESS), at Wright-Patterson AFB, OH. The primary focus of the research conducted under this program was to evaluate the feasibility of applying state-of-the-art software technologies (specifically intelligent agents), to the improvement of USAF logistics processes. The domain process selected for evaluation as part of this research effort was the aircraft MICAP process. We gratefully acknowledge the time and efforts of Supply, Maintenance, and Systems personnel at the USAF locations identified in this report for their participation and insightful inputs on the current MICAP process, as well as suggestions for future improvements.

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1.0 INTRODUCTION

This report documents the results of a survey of the process, people, information systems and databases associated with the USAF Mission Capable Parts (MICAP) system. The MICAP system establishes policies and procedures for obtaining material items necessary to repair USAF mission essential equipment of the highest priority. The MICAP process survey was conducted as part of a logistics research and development program titled *Intelligent Agents as Productivity Aides – Feasibility Study* (contract number F41624-9T-D-5002), managed by the USAF Air Force Research Laboratory, Logistics Sustainment Branch (AL/HESS) at Wright Patterson AFB, OH. One of the primary objectives of this program was to research the feasibility of applying state-of-the-art software technologies (specifically intelligent agents), to the improvement of USAF logistics processes. For the purpose of this survey, the process selected was the USAF MICAP process. The intent of this survey was to capture a “top-level” perspective of the current MICAP process as it applies to mission-critical aircraft components. Hence, the results documented in this paper are not intended to provide precise details (specific data screens used in CAMS, SBSS, etc.) about each step in the MICAP process. Rather, the discussion focuses on describing the general steps in the MICAP process and on identifying the systems/databases, information requirements, and interactions that occur between key personnel associated with the sourcing, requisitioning, tracking, and reporting of aircraft MICAP items. Based on this information and the objectives of the primary research effort, the survey also makes recommendations, particularly along the lines of enabling technologies, that could be implemented as part of an agent-based system to help make the MICAP process more effective and efficient.

2.0 SITE VISITS

The results documented in this survey of the MICAP process are based on research of current AF directives, particularly AFMAN 23-110, Volume II, *USAF Standard Base Supply System*, as well as discussions and interviews conducted with Supply, Maintenance, and AFMC systems personnel at the following locations:

Location	Type Personnel / Functions Interviewed
Wright Patterson AFB, OH	<ul style="list-style-type: none">▪ 88th ABW - Base Supply MICAP Specialists▪ HQ AFMC Systems and Functional POCs for SBSS, CMOS, D035A, EXPRESS, and WSMIS-RAM
Holloman AFB, NM	<ul style="list-style-type: none">▪ 49th ABW - Base Supply MICAP Specialists
Eglin AFB, FL	<ul style="list-style-type: none">▪ 33rd Wing Support Flight and MSL▪ 33rd FW Logistics Group CC▪ 60th Fighter Squadron Personnel:<ul style="list-style-type: none">▪ Maintenance Officer▪ Production Supervisors▪ Asset Demand Section▪ 96th ABW Base Supply MICAP Section
Hurlburt Field, FL	<ul style="list-style-type: none">▪ HQ AFSOC - Logistics Readiness Center Personnel▪ 16th SOW - Base Supply MICAP Specialists▪ 16th SOW MSL

	<ul style="list-style-type: none"> ▪ 16th SOW Talon II Squadron – Production Supervisor ▪ 16th HGS – Production Supervisor
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3.0 MICAP PROCESSING PROCEDURES

Although MICAP procedures apply to a wide variety of USAF assets, this paper focuses specifically on the base-level MICAP process as it applies to mission-critical aircraft items. Figure 1 portrays the general procedures for processing aircraft MICAP items, from the initial requisition of a part through receipt and closeout of the MICAP. The process outlined in Figure 1 may vary between MAJCOMs and units, depending on factors such as the mission of the unit, as well as command-unique directives and local operating policies (checklists) adhered to for processing MICAP requests.

3.1 Complete Issue/Turn-In Request, AF Form 2005

The first step in requisitioning a part from the USAF Standard Base Supply System (SBSS), involves the completion of the AF Form 2005, Issue/Turn-In Request. This form is filled out by the maintenance person who needs the part to complete the repair of an aircraft system, subsystem, or component, using the applicable technical order (T.O.) for reference. Once the form is completed by the maintenance person, it is turned over to a Supply representative in the flying squadron or maintenance unit for processing and requisition of the part (see Appendix 2 for a list of key data elements on the AF Form 2005).

3.2 Research Part Information

Once the AF Form 2005 is received by the Supply representative in the flying squadron or maintenance unit, the information on the form is re-verified before a part requisition is submitted to SBSS. This step includes researching the T.O. reference annotated on the AF Form 2005 in order to verify critical information about the requested part, including the primary part number, alternate (interchangeable) part numbers, and T.O. figure and index numbers. In addition to verifying the information on the AF Form 2005 provided by the maintenance person requesting the part, the Supply representative will also research additional part information using FEDLOG (CD-ROM), or through on-line access to the D043 Master Item Identification System (MIICS). The D043 system and (or) FEDLOG are used to obtain the National Stock Number (NSN), source of supply, alternate NSNs, etc. The Supply representative will also research part and stock number information for next-higher assemblies that, as an alternative, could be requisitioned to satisfy the original part request in the event that the primary component is not available.

At some locations, the maintenance personnel in the flying squadrons or maintenance units may not have the CAMS-SBSS interface capability to submit a requisition to SBSS. In this case, the part information is recorded on the AF Form 2005 by the maintenance person and phoned into a representative in the Demand Support Section of Base Supply. The necessary information is then re-entered on an AF Form 2005, or the MICAP Checklist (see Appendix 3), and the SBSS requisition is submitted directly, on-line to SBSS.

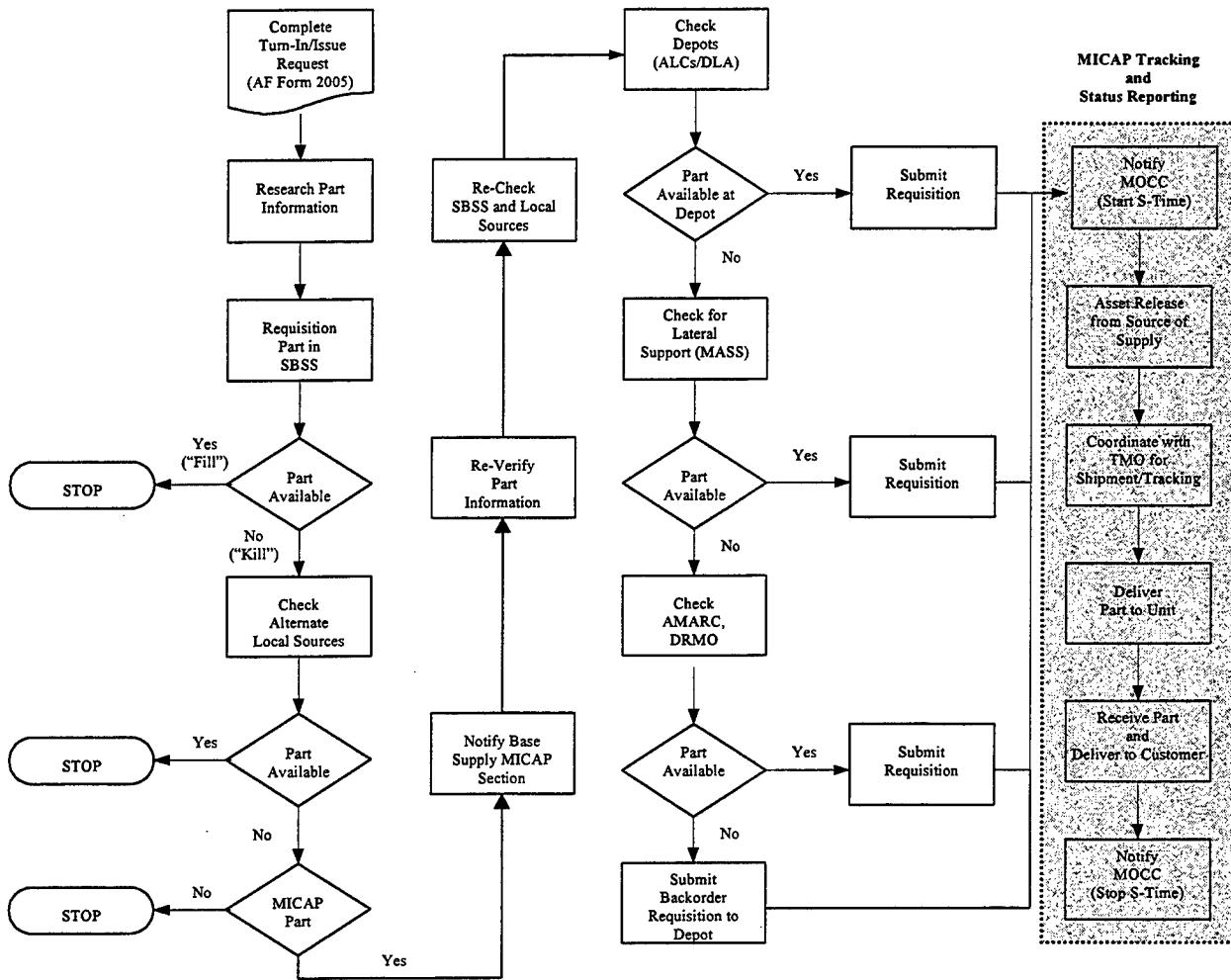


Figure 1. MICAP Process Flowchart

3.3 Requisition Part in SBSS

Once all the necessary information to order and source the part has been verified, the next step is to submit a requisition to SBSS to order the part. The requisitioning of the part in SBSS can occur in one of two ways. The first method is through a direct, on-line interface to SBSS, typically accomplished by Base Supply personnel. The second and more prevalent method is to submit the requisition directly from the flying squadron or maintenance unit through the Core Automated Maintenance System (CAMS) using the CAMS-SBSS interface screen.

The requisition to SBSS will identify whether the part is available through the local Base Supply system, at which point a “fill” notice is issued by SBSS and the part is pulled from stock and delivered to the requesting unit. If the part is not available through the Base Supply system, a “kill” notice is issued by SBSS, and additional information is provided to identify whether the part is available in a Material Readiness Spares Package (MRSP), In-Place Readiness Spares Package (IRSP), Mission Support Kit (MSK), or from a maintenance backshop on base, commonly referred to as a Due-In From Maintenance (DIFM) item.

3.4 Check Alternate Local Sources

If the initial requisition to SBSS “kills” (i.e. not available through normal stocks) the Supply representative in the flying squadron will pursue the following options (not necessarily in this order):

- Check alternate part / stock numbers in SBSS.
- If available, satisfy the request by obtaining the part from an MRSP, IRSP, or MSK. In this case, the part removed from one of these packages or kits as a MICAP filler is re-filled through a requisition to the respective depot.
- If available, satisfy the request using DIFM assets (parts in the base repair cycle).
- Check Next-Higher Assemblies (NHAs) and subassemblies.
- Check bench stock assets (XB3 expendable item)
- Check Time Compliance Technical Order (TCTO) kits.
- Check the parts box (tail number bin) for the “Cann Bird”. (See Note)
- Check to see if part is available on the “Cann Bird”. (See Note)

The purpose of checking all local sources up-front is to determine what, if any, local sources are available for obtaining the required part so the Production Supervisor can make an informed decision when filling the part request.

If the required part is cannibalized from the “Cann Bird” or another aircraft, a part requisition is made against the aircraft from which the part is removed (referred to as the donor aircraft). In this case, the cannibalization action simply transfers the potential MICAP status (and the requisition) from the receiver aircraft to the donor aircraft.

3.5 MICAP Decision Point

If the required part is not available through SBSS, or through an alternate local source, the Production Supervisor will make the ultimate decision on whether to go MICAP on the part request, cannibalize the part from the “Cann Bird” or another aircraft, backorder the part from depot, or simply cancel the request. The decision to go MICAP on the part request is based primarily on the criticality of the part, which is determined by the Production Supervisor using the Mission Essential Systems List (MESL) for the particular aircraft (or MDS). If a decision is made to MICAP the part, and the part is required to perform all missions defined on the MESL, then the aircraft is grounded in a Not Mission Capable Supply (NMCS) status. For NMCS aircraft, the MICAP request is assigned a MICAP Urgency Justification Code (UJC) of “1A”. In the event that the aircraft can still fly a subset of the missions defined by the MESL, the aircraft is put in a Partially Not Mission Capable Supply (PNMCS) status, and the MICAP request is assigned a MICAP UJC of “JA”.

3.6 Notify Base Supply MICAP Section

Once a decision is made by the Production Supervisor to go MICAP on a part request, the Supply representative in the flying squadron (or Demand Processing Section in Supply) turns the

MICAP request over for sourcing and processing to a MICAP specialist assigned to the Base Supply, Mission Support Section – commonly referred to as the MICAP section. Typically, the Supply specialist in the flying squadron will place a call to the MICAP specialist, who records the essential part and local sourcing information on a MICAP checklist that is used as a “quick reference” document and record of processing actions for the MICAP request.

3.7 Re-Verify Part Information and Re-Check SBSS / Local Sources

Once the essential part information is recorded on the checklist, the MICAP specialist re-verifies all part and T.O. information provided by the Supply representative in the flying squadron, and then proceeds to re-check SBSS as well as other local sources (i.e. MRSPs, IRSPPs, MSKs, NHAs, etc.) to ensure that the requested part is not available through local channels. Once this step is accomplished, and it is confirmed that the part is not available, a more extensive search begins to source the required MICAP part from an off-base source including the depots, other bases, etc.

3.8 Check Depots (ALCs and DLA)

If it is determined by the MICAP specialist that the part is not available on-base, then the next step is to check the depot source of supply, identified during the research of part information, for the required MICAP part or stock number. The primary depots typically sourced include the five AF Air Logistics Centers (ALCs), referred to as “F-Depots”, as well as the Defense Logistics Agency (DLA) depots, referred to as “S-Depots”. If the source of supply is an ALC, the MICAP specialist phones in the request and speaks directly with a specialist at the depot to determine if the part is available, and if so, requisitions the part, and the part is delivered via Federal Express to the requesting unit. Alternatively, if the source of supply is a DLA depot, the MICAP specialist phones in the request using the DESEX automated telephone system. The DESEX system will identify whether or not the part is available, and if it is, will allow the MICAP specialist to requisition the part. The same procedures apply when sourcing alternate stock numbers and NHAs through the depots in the event that the primary stock number (or part) is not available. If the part is not currently available at an ALC or DLA depot, then the next step is to try to source the part from another USAF base.

3.9 Check for Lateral Support Using MASS

The MICAP Asset Sourcing System (MASS) is used primarily by the MICAP specialist in Base Supply to source parts from other USAF bases, as well as for maintaining and reporting the current status of all MICAP items. When sourcing the part from another USAF base, the MICAP specialist inputs the stock number and quantity for the required part, and the MASS system performs an on-line query of all other known users of the part to determine which bases have the required part. The output of this query identifies all bases which have the part and groups these bases into two categories. The first category includes bases where the part (or asset) is accessible, meaning it is available and can be requisitioned and shipped from the source base through MASS. The second category includes bases that currently show an inventory balance for the part, but the part (or asset) is inaccessible and cannot be requisitioned through MASS due to circumstances such as exceeding the fill-rate level, frozen inventory, pending deployments,

etc. In this case, the MICAP specialist must contact the source base and obtain approval to get the required part.

Even though MASS supports the on-line requisition of accessible assets or parts, in most cases the MICAP specialist will contact the MICAP section at one of the potential source bases by phone to submit a requisition for a MICAP item. This procedure is typically followed because of the potential for delays in MASS submitting the requisition via SBSS at the requesting base to SBSS at the source base. The delays are usually attributed to instances when either MASS or SBSS is down due to software maintenance, hardware or network problems, batch processing, etc. Hence, by directly contacting the source base, the MICAP specialist at the requesting base can coordinate directly with a MICAP specialist at the source base to expedite the requisition and shipment of the MICAP part. In the event that the primary part or stock number is not available at another base, the MICAP specialist will use MASS to try and source and requisition an alternate stock number or NHA.

3.10 Check AMARC or DRMS

If the part cannot be located at a depot or sourced from another USAF operating base, the MICAP specialist can check the Aerospace Maintenance and Regeneration Center (AMARC) or the Defense Reutilization and Marketing Service (DRMS). AMARC is a primary source of parts from aircraft that have been put in extended storage or are being phased out of the current USAF inventory and sent to Davis-Monthan AFB, AZ for final disposition. The AMARC function removes serviceable parts from aircraft prior to placing them in extended storage, and stores parts that can then be requisitioned to repair aircraft that are still in the AF active inventory. In the event that the MICAP specialist elects to check AMARC, he/she must contact the AMARC representative at the prime ALC responsible for the applicable MICAP item or weapon system. If the part is available, the AMARC representative arranges for requisition and shipment of the MICAP item from the AMARC facility at Davis-Monthan to the requesting base. Another source for MICAP items is DRMS, which manages excess inventories of a variety of DOD assets, including aircraft parts, that are available for resale. The MICAP specialist can search the DRMS database through an on-line application called the Interrogation Requirements Information System (IRIS). IRIS is accessible via the World-Wide Web (WWW) and supports queries to determine if a particular MICAP item is available through DRMS. If the part is available, the MICAP specialist can contact DRMS and arrange for requisition and shipment of the MICAP item.

3.11 Commercial Vendor and Repair Sources

A couple of other potential sources worth mentioning that are not identified in the MICAP process flowchart shown in Figure 1, include local purchase through a commercial vendor, and the USAF Gold Flag program. Satisfying a MICAP request through one of these sources almost always requires pre-approval by the Item Manager at the respective ALC, and typically applies to MICAP items that have long (greater than 30 days) lead times for delivery from a depot, lateral base, or alternate source. For local purchase requests, the MICAP specialist can query the Inventory Locator Service (ILS) database to locate commercial vendors that could potentially provide the required MICAP item, or a suitable substitute identified in FEDLOG or

D043. The use of ILS for obtaining MICAP parts is restricted to expense items not stocked or issued by the Air Force Materiel Command (AFMC). These items include XB3 and XF3 items, but not XD2 repairable investment items. In addition, the commercial vendor supplying the MICAP XB3 or XF3 item must be FAA certified or approved to sell items to the government, and meet certain quality and inspection requirements.

Another source for satisfying a MICAP request is through the USAF Gold Flag program. In general, the Gold Flag program provides bases an avenue for identifying and contracting with a local commercial source for the repair of a MICAP item that is difficult to obtain through USAF and DOD supply systems. In the event that the MICAP specialist can identify a suitable repair source, the request must be processed and approved by the Item Manager at the respective ALC before the item can be repaired. Although local purchase and the Gold Flag program may be viable sources for obtaining mission critical MICAP items, additional time is incurred in coordinating paperwork and obtaining approval from the depot Item Manager. In addition, the use of one of these commercial sources may not be feasible due to budget constraints.

3.12 Submit Backorder Requisition to Depot

Once all potential sources for a MICAP item (local, depot, lateral, etc.) have been checked and verified, and it is determined that the item is not available, the only recourse is to submit a backorder requisition to the appropriate depot. At this point, the depot item manager becomes responsible for ensuring that the part is repaired through the depot, or repaired or procured through contractor sources.

3.13 MOCC Notification: Start “S-Time”

Once a decision is made by the Production Supervisor to go MICAP on the requisition of an aircraft part, the Production Supervisor is responsible for notifying the wing Maintenance Operations Center (MOCC) and changing the status of the aircraft that the MICAP requisition is “marked for”. At this time, the aircraft is put in a Not Mission Capable Supply (NMCS) status in CAMS until the serviceable MICAP part is received by Maintenance. This block of time is commonly referred to as “S-Time”, and starts at the time a requisition for a MICAP part is made to a depot, lateral base, or other source. Specific information pertaining to the MICAP action is also entered into MASS by the Base Supply MICAP section and updated periodically for purposes of status reporting.

3.14 Shipment and Tracking of MICAP Items

Once a MICAP item has been sourced and requisitioned from a base or depot, the Storage and Issue section (or similar function) of Base Supply at the sourcing base or depot pulls the MICAP item from stock and ensures the part is sent to the Base Transportation function for processing and shipment. Once received at Base Transportation, the item is processed through the Cargo Movement and Operations System (CMOS) and assigned a Transportation Control Number (TCN) for AF tracking purposes.

There are two primary methods for shipping MICAP items. The first, and more preferred method for shipping MICAP items (particularly for items weighing less than 150 pounds) is via

express transportation offered by commercial carriers such as FedEx® (predominant carrier), UPS®, DHL®, etc. Under this method, each MICAP item is assigned an Airbill Tracking Number (FedEx) or comparable number by the commercial carrier when the MICAP item is picked up at Base Transportation. Afterwards, the MICAP specialist can obtain the Airbill Tracking Number from Base Transportation, and check the current status and location of the MICAP item by accessing the commercial carriers tracking system via the WWW. The second method for shipping MICAP items (larger items in excess of 150 pounds) is through the use of USAF Air Mobility Command (AMC) airlift assets such as C-5, C-130, C-141, etc. In this case, the MICAP specialist can use the TCN and serial number of the shipping aircraft to track the location of the MICAP item (actually by tracking the aircraft) through the TRANSCOM Global Transportation Network (GTN). In either case, the primary issue is trying to obtain enough “up-to-date” information to support the MICAP status reporting activity.

3.15 MICAP Status Reporting

Once a MICAP item has been requisitioned, the process of tracking and reporting on the status of the MICAP item begins, and continues until the item is received by the Base Supply function at the requesting base. MASS is the primary system used to update and report the status of MICAP items. Using MASS, the MICAP specialist updates the current status of MICAP items and prints a MICAP Status Report (commonly referred to as the MICAP Status Board) that contains information used to prepare briefing slides for flying squadron personnel, Logistics Group Commander (LG), Wing Commander, etc. The MASS Status Board printout is output as a pre-defined report. However, briefing slides typically do not contain all of the information from the MASS Status Board printout, and the format of the slides varies from base to base depending on the level of detail specified by the LG, Wing Commander, etc. The updating and status reporting of MICAP items in MASS continues until the Base Supply function at the requesting base receives the MICAP item and it is entered in SBSS. At this time, the MICAP action is closed-out in MASS, but not in CAMS.

3.16 MOCC Notification: Stop “S-Time”

The accrual of “S-Time” stops in CAMS not when the part is received by Base Supply at the requesting base, but when it is delivered to the maintenance unit. Once delivered, the MICAP process is completed, and the Supply representative in the flying squadron notifies the Production Supervisor who in turn contacts the MOCC to change the status of the “marked for” aircraft in CAMS from NMCS to Not Mission Capable Maintenance (NMCM) until the part is installed.

4.0 PRIMARY MICAP SYSTEMS AND DATABASES

Figure 2 depicts the primary USAF/DOD systems and databases currently used to support the MICAP process, with the arrows identifying existing interfaces between systems. The initial requisition for an aircraft part is typically input through CAMS, which provides a screen for submitting a requisition to SBSS. Using information recorded on the AF Form 2005 by the maintenance person, the Supply specialist in the flying squadron will research part and stock number information using FEDLOG or the on-line interface to the D043 system prior to

submitting a requisition to SBSS. The SBSS system is used to check the availability of a part on base in peacetime operating stocks, MRSPs, IRSPs, MSKs, or through local backshops (DIFM items).

The D035A system interfaces with SBSS to provide the capability to requisition a part from the respective ALC depot in the event that a part cannot be sourced on-base. The D035A system supports on-line queries to determine the availability of a required MICAP part at an ALC depot. If the part is available at an ALC, a requisition must be made through SBSS, or by contacting the ALC directly. For DLA depots, the MICAP specialist can query and requisition MICAP parts from the appropriate DLA depot using the DESEX automated phone system. However, there is no computer interface between SBSS and the systems or databases at the DLA depots or warehouses, so on-line queries are not supported. In some cases, the requisition of MICAP items from DLA will require the approval of the Item Manager at the respective depot or ALC prior to release and shipment from a DLA warehouse.

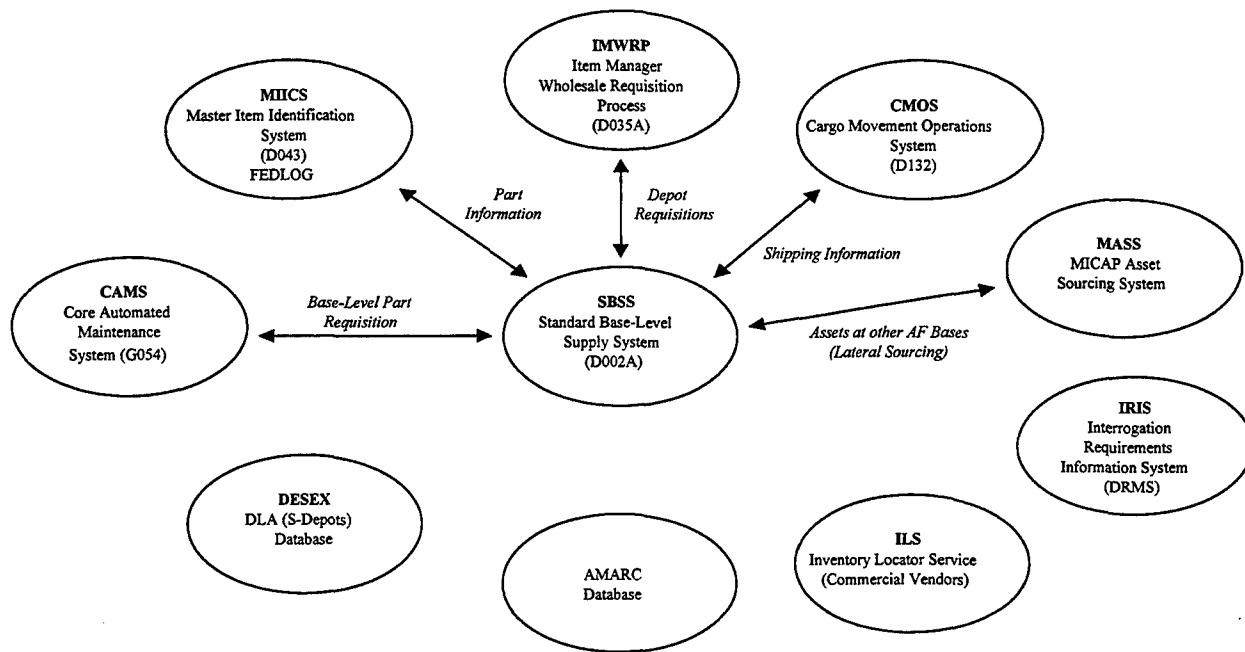


Figure 2. Primary MICAP Systems and Databases

If the MICAP item cannot be procured from an ALC or DLA depot, the MICAP specialist will use the MASS system to try and source the MICAP part from another USAF base. MASS is a PC-based system that interfaces with SBSS to obtain stock level information on parts at other bases. Once an item is located through MASS, a requisition can be input via MASS and sent to SBSS.

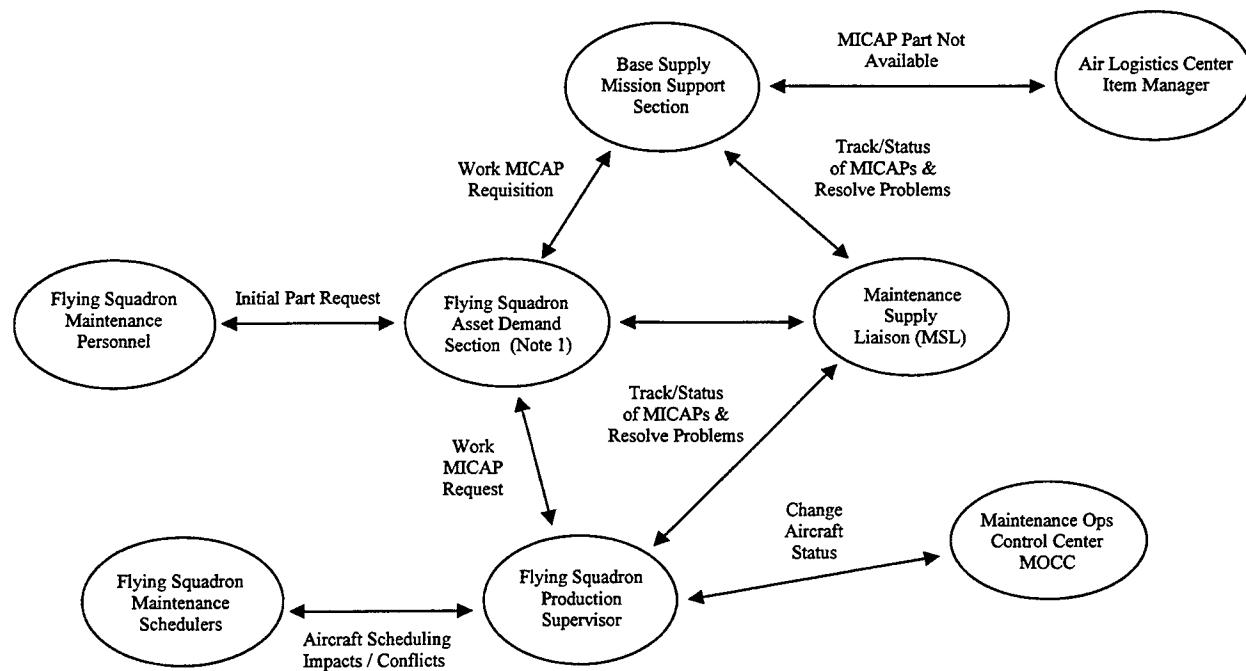
If attempts to source a MICAP item from depot or lateral sources are unsuccessful, the MICAP specialist can attempt to source the part from DRMS using IRIS, or from AMARC by contacting the AMARC representative at the respective ALC depot. If the MICAP specialist is

unsuccessful in sourcing the part from DRMS or AMARC, ILS can be queried to determine whether there are any other potential vendors for the MICAP item (XB3 and XF3 only). In most cases, particularly for newer weapon systems and certain repairable items, AMARC, IRIS, and ILS are not typically used to source MICAP parts.

If a MICAP item is requisitioned from supply stocks at a depot or lateral base, the item is delivered to the base Transportation function at the source base for packing and shipment to the requesting base. All shipping information, including the Transportation Control Number (TCN), is entered in CMOS which has an interface for passing the information to SBSS.

5.0 KEY PERSONNEL / FUNCTIONS

The base-level MICAP process is a high visibility process that has a direct impact on the overall success of a wing's flying mission. Because of the visibility and attention this process receives by mid-level and senior management personnel in a typical wing, a significant investment in personnel resources is made to ensure that the MICAP process operates as effectively and efficiently as possible, given current AF budget constraints for spares. Figure 3 attempts to isolate the primary interactions that occur between some of the key personnel and functions directly involved in MICAP researching, sourcing, requisitioning, tracking and status reporting activities in order to gain a better understanding of their needs and information requirements.



NOTE 1: This function may be centrally located in the wing and referred to as the "Demand Processing Unit/Section"

Figure 3. MICAP Process - Key Personnel and Interfaces

The maintenance person (crew chief or specialist) is responsible for removing and replacing failed or suspect parts in order to keep aircraft in a mission capable status so they can

fly their respective missions on the flying schedule. However, in order to obtain a replacement part the maintenance person must fill-out an AF Form 2005, Turn-In/Issue Request, to get the part on order and initiate the disposition process for the turn-in part. **While the primary concern of Maintenance personnel is getting the part they need to fix the aircraft**, they are also responsible for ensuring that the AF Form 2005 is filled out *accurately* (based on part information in the respective T.O) to help ensure the correct part is ordered. Their primary interface for ordering parts is the Supply specialists assigned to an Asset Demand Section (supply point) in each flying squadron, or the Demand Processing Unit in the wing Maintenance-Supply Liaison (MSL) function or Base Supply.

The Supply person receives the AF Form 2005 from the maintenance person, verifies the T.O. and part information on the form, cross-references the part number to an NSN, then makes the initial requisition for the part in SBSS. **The Supply specialist's primary concern is to get Maintenance personnel the part they need to fix the aircraft**. By accepting responsibility for requisitioning aircraft parts, the Supply specialists assigned to the flying squadron help ensure that the wrong part is not ordered inadvertently, as well as provide the time and expertise required to perform more extensive research and sourcing of aircraft parts. If the initial requisition to SBSS shows that the part is available through normal stocks, the part is issued by Base Supply and delivered to the maintenance unit. In this case, there is typically no need for the Supply representative to interface with any other personnel or functions. However, if the initial requisition for a critical part "kills", the Supply specialist will start the MICAP checklist process, and perform additional research to check and see if the required part, a suitable substitute, or NHA is available on-base through normal stocks, a backshop, MRSP, TCTO kit, "Cann Bird", etc. In the event that a local source for the part cannot be identified, the Supply specialist in the flying squadron will contact the Production Supervisor to get a decision on how to handle the part requisition. If the Production Supervisor decides to go MICAP on the part, the Supply specialist places a phone call to the Base Supply Mission Support Section (MICAP section) and turns the MICAP request over to a MICAP specialist for further processing.

The MICAP section in Base Supply is primarily responsible for working on MICAP requests that cannot be sourced and requisitioned by Supply specialists in the flying squadrons. **The primary concern of the personnel that work in the MICAP section is to ensure the MICAP part is sourced, requisitioned, and delivered to the flying squadron**. Typically, the Supply personnel that work in this function have specific expertise in working on MICAP requests, and have accessibility to additional part sourcing resources, such as MASS, D035, ILS, etc., that may not be available in the flying squadron. Hence, the MICAP section is a major player in all phases of the MICAP process. Initially, a Supply specialist in the MICAP section will interface directly with a Supply specialist in the flying squadron to obtain all of the requisitioning and sourcing information previously documented on the MICAP checklist for the required part. Once this is accomplished, the MICAP specialist maintains close contact via telephone or e-mail with the Supply representative in the flying squadron to provide current status and disposition information on the MICAP request. In addition to the flying squadrons, the MICAP specialist also interfaces with a variety of other functions, including the wing MSL function to provide status information on MICAP requests, the MICAP section at other bases for

lateral requests, and with ALC Item Managers to work on and coordinate MICAP requests that cannot be sourced locally, laterally, or through normal depot channels.

As stated previously, the Production Supervisor is ultimately responsible for making a decision to cannibalize an aircraft to fill a potential MICAP request, or go MICAP on the part. **The primary concern of the Production Supervisor is to ensure that the aircraft assigned to the squadron can complete the tasks dictated by the flying and maintenance schedules.** They may interface with numerous personnel during the processing of a MICAP request, including the Squadron Maintenance Officer, Crew Chiefs and Maintenance Specialists, other Production Supervisors, etc. However, their primary contacts during the MICAP process include Supply specialists in the squadron, the Maintenance Scheduler, the MOCC, and MSL personnel. Before reaching a decision to go MICAP on a part, the Production Supervisor will work closely with the Supply specialist in the squadron to determine what, if any, options for locally sourcing the part are available. In addition, the Production Supervisor will also coordinate with the Maintenance Scheduler assigned to the squadron to assess the impact on flying and maintenance schedules, which are built and adjusted through close coordination with the Production Supervisor. Once the decision is made to MICAP a part, the Production Supervisor notifies the Supply specialist, and the request is turned over to the Base Supply MICAP section for processing. It is also the responsibility of the Production Supervisor to contact the MOCC by radio or phone and change the status of the aircraft to NMCS. This notification process is repeated once the MICAP part is received at the supply point in the flying squadron, at which time the Production Supervisor changes the aircraft status to NMCM until the replacement part is installed on the aircraft.

The MSL function acts as a liaison between the Supply and Maintenance functions in a wing. The personnel assigned to this function are typically mid-level or senior Supply NCOs that have previous experience in the MICAP process. **One of their primary concerns is ensuring that “supply discipline” is maintained in the processing of MICAP requests.** During the MICAP process, MSL personnel interface primarily with the Production Supervisor and Supply specialists in each flying squadron, as well as the Base Supply MICAP section, to track and status the disposition of MICAP requests. The MSL also provides assistance to units in resolving problems that may arise between Maintenance and Base Supply during the MICAP process.

The MOCC is responsible for coordinating and tracking aircraft maintenance activities. **One of the MOCC’s primary concerns is accurately maintaining the current status of each aircraft assigned to the wing.** Hence, during the MICAP process they interface directly with the Production Supervisor in each flying squadron to obtain the current mission capable status of each aircraft. This information is recorded by the MOCC in CAMS and subsequently used to prepare reports for squadron and wing senior management personnel.

The Maintenance Scheduler in each flying squadron is responsible for preparing and coordinating weekly maintenance schedules for the squadron. The scheduler works closely with the Production Supervisor in preparing inputs and changes to the schedule. In addition, the scheduler also works closely with Operations personnel in the squadron to coordinate

maintenance activities with the planned flying schedule. The Production Supervisor will coordinate with the scheduler on MICAP and cannibalization decisions that could have a direct impact on the squadron's flying and maintenance schedules. **The scheduler's primary concern is ensuring that aircraft maintenance activities are performed in a manner that does not conflict with the squadron's flying mission.** These activities include the scheduling of periodic and daily maintenance inspections, Time Compliance Technical Order (TCTO) actions, etc.

In general, ALC Item Managers are responsible for managing the procurement and repair of AF assets, including critical aircraft equipment items requisitioned from the depots by base-level organizations. **The Item Managers at each ALC interface with MICAP specialists in Base Supply to provide assistance on MICAP requests that cannot be sourced locally, laterally, or through the normal depot requisition process.** In this case, the respective ALC Item Manager for the MICAP part works directly with commercial vendors who are supplying or repairing the required part to satisfy the MICAP request.

6.0 GENERAL OBSERVATIONS AND RECOMMENDATIONS

The following is a summary of some of the most important observations and comments documented during site visits and interviews conducted as part of the MICAP process survey. Following each set of observations and comments, is a summary of recommendations primarily focused on "enabling" hardware and software technologies that could be incorporated as part of an agent-based system to help make the MICAP process more effective and efficient. For clarity, the list is structured to align as closely as possible with the general steps in the MICAP process flowchart previously discussed in section 3.0 and depicted in Figure 1.

6.1 Complete AF Form 2005, Issue/Turn-In Request

Observations / Comments

- The AF Form 2005 does not exist in an on-line format.
- Supply personnel in the flying squadron provide maintenance personnel with an informal, "quick reference" list of frequently used stock and part numbers to use as a guide when filling-out the AF Form 2005. The intent of this list is to reduce the time and errors associated with completing the AF Form 2005.
- A maintenance person can expend a lot of time manually researching part information in the T.O. to complete the AF Form 2005.

Recommendations

- Use "Smart Part" technology (bar code or microprocessor chip) that is installed on all new parts, and retrofitted as a TCTO action to old parts. This technology would virtually eliminate the need for the maintenance person to manually research and fill out part information and allow for rapid updates to databases (e.g. D043) containing detailed

information on the “Smart Part”. The “Smart Part” could be encoded with attributes such as the part number, stock number, alternate stock numbers, manufacturer, etc., to help significantly reduce the time currently spent on part research.

- Supplemented by “Smart Part” technology, introduce “Smart Forms” (e.g., order forms that fill themselves out automatically when a defective part is swiped) to automate the AF Form 2005 thereby reducing paperwork and errors.

6.2 Research Part Information

Observations / Comments

- A significant amount of time can be expended by Supply specialists in the flying squadron’s Asset Demand Section (or centrally located Demand Processing Section) verifying part information on the AF Form 2005, and performing additional research in FEDLOG or D043 to identify alternate stock numbers, NHAs, Source of Supply, etc.
- Even with the use of “quick reference” lists by maintainers to fill out the AF Form 2005, the Supply specialists in the squadron’s Asset Demand Section (or Demand Processing Section) still find that an inordinate number (possibly as high as 60%) of AF Form 2005s received from Maintenance personnel have incompatible stock and part number information.

Recommendations

- Using “Smart Part” and “Smart Form” technologies, there should be no need for the Supply specialist to verify the initial information provided by the maintenance person on the AF Form 2005. Once the “Smart Part” is swiped, the essential part attributes (e.g. part number, stock number, etc.) would be recorded on the “Smart Form”, thereby eliminating problems with incompatible stock and part number information. The “Smart Form” would also support on-line entry of additional information (e.g. document number, quantity, etc.) not encoded on the “Smart Part”.
- Design and implement a software agent process (“part research agent”) that would assist the Supply specialist in researching and retrieving part information (e.g. alternate stock numbers, NHAs, etc.) in aircraft T.O.s and FEDLOG/D043.

6.3 Requisition Part in SBSS

Observations / Comments

- At times, a Supply specialist can submit a query to SBSS, find the part is not available, but resubmit the requisition a few seconds later and find that the part is available. This increases the time devoted to requisitioning the part (multiple system queries) and can cause a lot of frustration for the Supply person.

- The management notice (“kill” notice) issued as a result of the requisition may indicate that a part is available in an MRSP, IRSP, or MSK, when in reality the part has been removed from a kit to support a deployment and is therefore not available.

Recommendations

- Design and implement an agent process (“**part sourcing agent**”) that would assist the Supply specialist in locating a part in SBSS by persistently searching the SBSS database, as well as assets at other supply points (i.e. MRSPs, IRSPs, etc.) on base at time intervals prescribed by the user.
- The use of “**Smart Part**” technologies would allow an agent-based system to effectively track the status and location of all parts, including those deployed or in-transit. The “**part sourcing agent**” could be tasked to find out exactly what parts actually exist on base and are available for requisition at any point in time.

6.4 Check Alternate Local Sources

Observations / Comments

- Checking alternate sources (outside SBSS) for the required part such as TCTO kits, DIFM assets, “Cann Bird” parts box (tail number bin), etc., can be a time-consuming process for the Supply specialist involving numerous phone calls to other potential sources on base.
- Managing part and maintenance issues and activities for the squadron “Cann Bird” can be a full-time job.
- Repairable Processing Centers (RPCs) previously existed as a centralized supply processing point to support backshops and provide visibility on the location of parts in the I-Level “pipeline”. However, RPCs were abolished due to budget constraints and the Air Force migration to more of a “two-level” maintenance concept. Now, it is difficult to rapidly check on the availability of parts to fill potential MICAP requests in the remaining I-Level backshops because SBSS does not provide accurate part location and status information.

Recommendations

- “**Smart Part**” technologies would provide the means for identifying the current location and status of DIFM assets in the I-Level pipeline (at supply points and in the shops), as well as the type and location of items in “Cann Bird” parts boxes, TCTO kits, etc.
- The “**part sourcing agent**” recommended in Section 6.3 could be tasked to search SBSS and all other potential sources on-base in a manner defined by the user.
- As an alternative to bar code readers or scanners, where a person has to be involved in the process, the “**Smart Part**” could transmit its location to SBSS automatically or on-demand.

The status of the “Smart Part” could then be queried by a “**part status and tracking**” agent to facilitate accurate status reporting.

6.5 MICAP Decision Point

Observations / Comments

- The Production Supervisor’s decision to go MICAP on a part is based not only on the criticality of the item as specified by the MESL, but on a variety of other factors, including the potential impact the MICAP action would have on aircraft maintenance and flying schedules, as well as the time associated with cannibalizing the part from the squadron’s “Cann Bird” or another aircraft. However, since the scheduling process is still done manually, there is no decision support tool or capability to allow a Production Supervisor to quickly forecast the impact of a decision to cannibalize or MICAP a part on maintenance and flying schedules.
- Since accurate and total visibility over available parts on base can be a problem at times, the Production Supervisor can inadvertently cannibalize a part from an aircraft, only to find out after the fact that the part was available locally. This action can cause aircraft mission scheduling problems and waste significant man-hours removing, installing, and re-installing parts.

Recommendations

- “**Smart Part**” technologies, coupled with the sourcing logic of a “**part sourcing agent**”, could provide rapid and accurate visibility of the location and status of parts on base and help reduce the number of inadvertent “cann” actions.
- Design and implement “**scheduling aids**” (see Appendix 4) or an expert-based scheduling tool to assist the Maintenance Scheduler (as well as the Operations Scheduler) rapidly create and update aircraft flying and maintenance schedules. Through a natural language processing interface, the “**scheduling aids**” could assist the Production Supervisor and Schedulers in performing a “quick-look”, near-term assessment of the potential schedule impacts resulting from a MICAP or cannibalization decision. The intent is to give the Production Supervisor and Maintenance Scheduler a way to rapidly access, query, and analyze schedules on-line to help answer questions like, “Is aircraft 270 scheduled to fly tomorrow, or be out for scheduled maintenance?”, and if so, “How will the flying schedule be affected if I cannibalize a part from 270?”

6.6 Notify Base Supply MICAP Section

Observations / Comments

- The MICAP notification is typically made by the Supply specialist in the flying squadron via a telephone call to the MICAP specialist in the Base Supply Mission Support Section. Once

contacted, the Supply specialist in the squadron reads back the information previously documented on the MICAP checklist (or AF Form 2005) to the MICAP specialist, who in turn, transcribes the information onto another MICAP checklist.

Recommendations

- The “Smart Forms” technology recommended in 6.1 could be used to support the posting of the AF Form 2005 and MICAP checklist to a secure WWW site for rapid access by MICAP specialists in Base Supply. This would eliminate the redundant “form-filling” effort associated with the MICAP checklist and eliminate potential errors in transcribing information, particularly part and stock numbers, over the phone.

6.7 Re-Verify Part Information / Re-check SBSS and Local Sources

Observations /Comments

- The MICAP section re-verifies the part information received from the Supply specialist in the flying squadron to ensure all information is accurate. Typically, only 3% or less of the MICAP requests received by the MICAP section from the Supply specialist in the flying squadron are found to have erroneous information (i.e. part numbers, stock numbers, etc.).
- The MICAP section re-checks SBSS and all other local sources to ensure that the required part is not available on base.

Recommendations

- “Smart Part” technologies, coupled with the “part research agent” process recommended in Section 6.2, would eliminate the need to re-verify part information in T.O.s and FEDLOG/D043. In fact, most of the part information, including the part number, stock number, T.O. Figure and Index, etc., could be recorded automatically when the “Smart Part” is removed and scanned. Any additional research (NHAs, alternate stock numbers, etc.) would be accomplished by the “research agent”.
- The “Smart Forms” technology recommended in Section 6.1 could be used to support the posting of the AF Form 2005 and MICAP checklist to the web for rapid access and on-line update of any additional information by MICAP specialists in Base Supply.
- The “part sourcing agent” described in Section 6.3 would eliminate the need to re-check SBSS and local sources. The sourcing agent could be tasked by the user to search all local sources, including SBSS, in a persistent and structured manner.

6.8 Check Depots (ALCs and DLA)

Observations /Comments

- There is no on-line capability to directly source and requisition parts from DLA warehouses. The MICAP specialists must use the DESEX automated phone system to source and requisition parts from DLA, and in some cases, release of the part may require the approval of the respective Item Manager responsible for the part.
- The MICAP specialist can source MICAP parts from the ALCs via on-line access to the D035A system, or by phoning an ALC customer service representative at the respective ALC (Source of Supply). However, a depot requisition action can only be accomplished by submitting a requisition through SBSS, or through the ALC customer service representative.
- Due to batch processing of MICAP requisitions, there may be a time lag between the time a MICAP requisition is called into an ALC customer service representative, or the DLA DESEX system, and the time the requisition is actually submitted to the D035A or DLA system. Hence, to save time in requisitioning and obtaining the part, a MICAP specialist may elect to laterally source the part from another base first before checking the depots, even though USAF policy requires that the MICAP specialist to check depots first before sourcing MICAP items from other USAF bases.

Recommendations

- Based on the concept of a “federated system” (see Appendix 4), develop a “single point-of-entry” system for sourcing and submitting requisitions to off-base MICAP part sources, including the ALCs and DLA.
- Enhance the capabilities of the on-base “part sourcing agent” described in Section 6.3 (or design and implement a comparable off-base “sourcing agent”) to assist the MICAP specialist in searching all (or by exception) potential off-base sources for the MICAP part. The “sourcing agent” could be tasked by the user to search off-base sources in a persistent and structured manner. Based on the results of the search, the MICAP specialist would select a source and submit an on-line requisition to the respective system (D035A or DLA).

6.9 Check for Lateral Support Using MASS

Observations /Comments

- MASS software only supports the sourcing of parts from other USAF bases with SBSS.
- When using MASS to laterally source a MICAP part, a MICAP specialist may elect to source and requisition the part only from a base that has a good “track record” for expeditiously processing and shipping MICAP items. In some cases, the base with the best “track record”

may not be the closest base, nor the best candidate to satisfy the requisition based on the current stock level for the MICAP part.

- Since MASS operates as a separate system with its own database, it must periodically interface with SBSS to retrieve inventory information on MICAP parts. When the SBSS system is down for maintenance or performing off-line batch processing operations, MASS may be unable to receive or give updates to SBSS, hence the MICAP specialist does not have consistent and accurate visibility of MICAP source parts at other bases.
- Before searching and sourcing a MICAP part in MASS, the MICAP specialist must again input part information previously recorded on the AF Form 2005, MICAP checklist, and SBSS.
- The MICAP sourcing process does not effectively leverage on or support an automated capability to source MICAP parts from other DOD service components, particularly common or preferred stock items that are used by multiple aircraft in the DOD inventory (e.g. aircraft parts identified as part of a MIL-STD avionics architecture). In some cases, a Navy or Marine airbase that has the MICAP part may be located closer than the nearest USAF base or depot source.
- In certain cases, the MICAP specialist at the requisitioning base will submit a requisition through MASS as a MICAP, but the requisition does not “kickout” as a MICAP in SBSS at the source base.
- Requisitioning and shipping MICAP parts from other USAF bases can be an expensive venture, considering the costs incurred for shipping the part via express carriers like FedEx. However, there is no logic in MASS to give the MICAP specialist the option to consider requisitioning the part from a base that not only has the MICAP part, but has a USAF aircraft (C-141, C-130, etc.) currently on station or en-route that can deliver the MICAP part to the requesting base (final destination or another en-route location).

Recommendations

- Based on the concept of a “**federated system**”, develop a “single point of entry” system for sourcing and submitting requisitions to off-base MICAP part sources, including other USAF and “sister service” bases.
- Enhance the capabilities of the on-base “**part sourcing agent**” described in Section 6.3 (or design and implement a comparable off-base “part sourcing agent”) that would assist the MICAP specialist in searching all (or by exception) potential off-base sources (including USAF and “sister service” bases) for the MICAP part. The “sourcing agent” could be tasked by the user to search off-base sources in a persistent and structured manner. Based on the results of the search, the MICAP specialist would select a source and submit an on-line requisition to the respective source system (SBSS or “sister service”).

- Enhance the capabilities of the off-base “**part sourcing agent**” to specifically “flag” lateral bases that can provide the MICAP part and ship it within 24 hours via an in-bound or on-station USAF aircraft (C-141, C-130, etc.) to the requesting base (final destination or another en-route location). As part of the sourcing logic, the “sourcing agent” could check the GTN system to verify the current status and location of AMC airlift assets.
- Since the off-base “**part sourcing agent**” would incorporate the sourcing and requisitioning capabilities of MASS, as well as the capability to perform a more expanded search under the concept of a “**federated system**”, there may be no need for MASS.
- Expand the breadth of the search for potential MICAP sources to include other DOD service components with “like” items.
- Formulate and implement initiatives (policy, hardware/software upgrades, etc.) to reduce the downtime incurred by SBSS and other MICAP related systems for software/hardware maintenance and batch processing operations. This should help reduce the additional time associated with the off-line, manual processing of MICAP requisitions.

6.10 Check AMARC, DRMO, Commercial Vendors

Observations /Comments

- There is no on-line capability to directly search and source parts from the AMARC database. MICAP specialists must contact an AMARC representative at an ALC by phone to source and requisition parts from AMARC.
- Through the WWW, a MICAP specialist can query the DRMS database called IRIS to check on the availability of a MICAP part. However, if a part is located in IRIS, the MICAP specialist must contact DRMS by phone to arrange for requisition and shipment of the part.
- Using ILS, the MICAP specialist can perform an on-line query, via the WWW, of commercial vendors to find potential local purchase sources for a MICAP part. However, the requisition of MICAP items from vendors identified in ILS is restricted to XB3 and XF3 items, and must be accomplished off-line after justification and approval (e.g. DGSC).

Recommendations

- Based on the concept of a “**federated system**”, develop a “single point of entry” system for sourcing and submitting requisitions to off-base MICAP part sources, including AMARC, DRMS, and ILS.
- Enhance the capabilities of the “**part sourcing agent**” described in Section 6.3 (or design and implement a comparable off-base “sourcing agent”) to enable it to assist the MICAP

specialist in searching for a MICAP part at all (or by exception) potential off-base sources, including AMARC and DRMS. The “sourcing agent” could be tasked by the user to search off-base sources in a persistent and structured manner. Based on the results of the search, the MICAP specialist would select a source and submit an on-line requisition to the respective source system, including IRIS, AMARC, and ILS.

- For MICAP parts procured through local purchase from an ILS vendor, “Smart Form” technology could be incorporated to allow the MICAP specialist to automatically submit an on-line requisition request (“Smart Form”) to the agencies required for coordination and approval of local purchase items.

6.11 MOCC Notification

Observations /Comments

- Discrepancies arise between “S-Time” (Supply Time) values recorded in CAMS and MASS. The problem can be attributed to differences in procedures for starting and stopping “S-Time” in CAMS and MASS. In CAMS, “S-Time” starts and stops when the Production Supervisor contacts the MOCC and changes the mission capable status of the aircraft. However, in MASS the start of “S-Time” occurs when the MICAP part is requisitioned and ends when the item is received by the requesting Base Supply and a “Due-Out” notice is issued. In some cases, this causes conflicts between Maintenance and Supply personnel because “S-Time” directly impacts the calculation of high-visibility metrics such as FMC, NMC, NMCS and NMCM rates.

Recommendations

- The use of “Smart Part” and “Smart Form” technologies that support scanning and electronic signatures, along with a *single* system and process for tracking and recording “S-Time”, should eliminate the problems associated with the “accurate” recording of S-Time.

6.12 MICAP Shipment, Tracking, and Status Reporting

Observations / Comments

- Of all the steps and activities associated with the current MICAP process, the status and tracking of MICAP requisitions seemingly requires the most significant investment of personnel resources and time. Supply specialists in the Base Supply MICAP function, MSL, and flying squadron spend a lot of time checking, updating, and/or reporting on the status of MICAP items to mid-level (e.g. Production Supervisor) and senior management (e.g. Logistics Group Commander) personnel. In addition, outside of MASS (for status board reporting and updates) and WWW access to commercial carriers (to check airbill tracking numbers), there are really no other systems or tools to help Supply personnel perform their job more effectively and efficiently. Hence, Supply personnel at the requisitioning base resort to making numerous telephone calls and e-mail inquiries on a daily basis between

functions on-base (e.g. MSL and MICAP section, Production Supervisor), as well as to the sourcing base or depot to try and obtain the most current status on MICAP requisitions.

- When a MICAP part is issued by Base Supply at the source base or depot, it is delivered to Base Transportation for shipping. At Base Transportation, the part is processed through CMOS and assigned a Transportation Control Number (TCN). Later in the day, the part is picked up by a commercial express carrier (FedEx, UPS, etc.) for shipment. Once the carrier picks up the MICAP part from Base Transportation, there is no way to actively track the item in USAF systems while it is in transit because there is no interface between USAF systems and the commercial carrier's system. As an alternative, the MICAP specialist can track the MICAP part via WWW access to the commercial carrier's system by obtaining the tracking number assigned by the carrier to the MICAP shipment at the time of pick up from Base Transportation. However, in order to get the tracking number, the MICAP specialist must place a phone call directly to the Base Transportation office.
- MICAP parts laterally sourced, requisitioned, and shipped from USAF bases overseas can take up to 20 days to arrive at the requesting destination. This is because when a MICAP part arrives in the CONUS, it may not continue to be handled and shipped as a priority item. No specific reason was given for why this problem occurs, but it may be attributable to errors in shipping manifests and related documents, miscommunication with contract carriers, or training.
- MASS provides the capability for the MICAP specialist to update the status and remarks associated with MICAP requisitions. In addition, MASS has the capability to produce a pre-defined status report, commonly referred to as the MICAP Status Board, on all base-level MICAP requisitions. However, the format and information provided by the MICAP Status Board report is not very "user-friendly" (see Appendix 5). Hence, Supply personnel in the MICAP section of Base Supply, as well as MSL personnel, typically extract information and create their own "status slides" for daily/weekly briefings/updates to the Logistics Group CC, Wing CC, etc.
- As discussed previously in the "Key Personnel and Functions" section, the Production Supervisor is the key decision maker in the MICAP process. Hence, he/she has the most pressing need for up-to-date status on MICAP requests to effect aircraft maintenance and flying schedule decisions. However, each day, the Production Supervisor carries around a copy of the MICAP Status Board printout (typically received each morning) in the 4 or 6-PAX (pick-up truck), and annotates changes to the status of MICAP items throughout the day based on updates received through radio, phone, or face-to-face contact with the MSL or Supply specialists in the squadron Asset Demand Section.
- The MICAP status board does not typically identify the "common part name" (referred to by Maintenance personnel) for the MICAP item. The disconnect between the nomenclature identified on the MICAP Status Board printout and the nomenclature referred to by Maintenance personnel can probably be attributed to the fact that the part nomenclature in MASS is based on the nomenclature in SBSS, which in turn, directly relates to the

nomenclature passed to SBSS from MIICS (D043). However, Maintenance personnel may use different nomenclature terminology for referencing the same part.

- The status of the MICAP request recorded in MASS, and posted on the MICAP Status Board printout, does not always accurately reflect the actual status of the MICAP request as reported in CAMS. This discrepancy is due to the problem alluded to in Section 6.11, which involves differences in policies and procedures for updating the status of MICAP "S-Time" in CAMS versus MASS. Hence, Production Supervisors, who "keep score" based on when the part is delivered to the flying squadron and reported to the MOCC, find that MASS has dropped MICAP items off the daily MICAP Status Board printout even though the part has not been delivered to the flying squadron.
- Cannibalization procedures cause problems in the accurate recording of MICAP actions in MASS. For instance, when the "Cann Bird" in a flying squadron is used to source a MICAP part, the MICAP transaction recorded in MASS should be transferred from the "receiver" aircraft that the cannibalized part is installed on, to the "donor" aircraft from which the part was removed so the MICAP request can be tracked accurately. However, in some cases, the MASS Status Board printout must be manually annotated by the Production Supervisor to accurately reflect the transfer or change of the MICAP action from the "receiver" aircraft to the "donor" aircraft. The MASS system is supposed to handle the cannibalization action automatically, but it doesn't always work correctly.
- On a typical day, the Production Supervisor in a typical flying squadron will interface (face-to-face or by phone) with the wing MSL function numerous times to check the status of MICAP requisitions or work MICAP issues.

Recommendations

- Based on the concept of a "federated system", develop a "single-point-of-entry" system for tracking the status and location of MICAP parts. This would eliminate the need for the MICAP specialist to phone Base Transportation to obtain the tracking number issued by the commercial carrier. In addition, a "single point-of-entry" system would provide the MICAP specialist direct access via the WWW to the commercial carrier's system in order to check the current status and location of MICAP parts.
- Utilize "**Personal Data Assistant (PDA)**" technologies (see Appendix 4), which could potentially be configured to support cell phone, WWW, and/or wireless hardware technologies, to provide the Production Supervisor with accurate, on-demand status of all MICAP requests. The use of a PDA device would eliminate the need for a Production Supervisor to have to carry around and annotate the MICAP Status Board printout.
- With "**Smart Part**" technology, the common name for the part used by Maintenance personnel could be cross-referenced automatically to the FEDLOG/D043 primary part nomenclature identified on the bar code or microchip installed on the part. This would eliminate the need for the Production Supervisor to annotate "meaningful" part

nomenclatures on the MICAP Status Board printout, and still support standard part nomenclatures in FEDLOG/D043

- “Smart Part” technologies would provide the capability to automatically locate and status MICAP parts from the time the part is requisitioned at the source base, depot, or vendor source, through shipment by the contract carrier until it arrives at the requesting base. This could potentially save significant man-hours devoted to phone calls and e-mails now used to check and report the status of MICAP requisitions.
- Eliminate the need for MSL and MICAP specialists to produce MICAP status briefing slides off-line in MS PowerPoint™ or similar software packages. Supplemented by “Smart Part” technologies, a MICAP “part status and tracking agent” could be tasked to automatically track and update the status of MICAP parts at pre-defined time intervals, or on demand. In addition, the MICAP “part status and tracking agent” could also produce MICAP Status Board printouts or slides by incorporating “Smart Form” technology. In this case, the current MICAP Status Board printout from MASS would be replaced by a “Smart Form” that would update itself automatically when directed to by the “status and tracking agent”. In addition, the level of detail presented on the “Smart Form” could be controlled by the user (e.g. Wing Commander, Logistics Group Commander, Maintenance Officer, Production Supervisor, etc.) to display only the information they want to see on the status of MICAP requisitions.

7.0 CONCLUSIONS

The USAF MICAP process is a **high-visibility process** that receives the keen attention of Air Force senior management personnel at all levels of command, particularly the wing level which is responsible for conducting day-to-day flying operations and maintenance activities. The MICAP process receives close scrutiny because it deals exclusively with the issue of sourcing and obtaining critical spare parts for USAF weapon systems and equipment that, in turn, have a direct impact on the peacetime and wartime readiness posture of the Air Force. Because of this impact, coupled with decreasing budgets for spares, it is important that the MICAP process be managed and executed in the most effective and efficient manner possible. Recognizing the visibility and impact of the MICAP process, the primary intent of this report was twofold. First, capture and understand the process, people, systems, and potential problems associated with the current MICAP process. Secondly, determine how state-of-the-art technologies, primarily software “agent” related technologies, can be applied to help people directly involved in the MICAP process do their jobs better and smarter.

Based on an evaluation of the process, systems, and people directly involved in the MICAP process, as well as observations and issues highlighted by key personnel interviewed during this survey, it is evident that the MICAP process is a very manpower-intensive and time-consuming operation. Furthermore, it is a process that currently requires the direct support of systems and databases that, for the most part, are not linked. Some of the more important points about the MICAP process discussed or alluded to in this report, and focused on to help formulate recommendations include the following:

- Extensive resources and man-hours are devoted to researching and sourcing MICAP parts, as well as tracking and reporting the status of MICAP requisitions.
- A significant amount of “stubby-pencil” effort is involved in filling out part requisition forms and MICAP checklists, as well as annotating MICAP Status Board printouts.
- A considerable amount of redundant effort is expended tracking and reporting the status of MICAP requisitions, as well as researching and sourcing MICAP parts.
- No automated tools or applications (beyond MASS) effectively support the rapid and accurate researching and sourcing of MICAP parts, or tracking and reporting the status of MICAP requisitions.

The “agent” technologies discussed in Section 6, supplemented by hardware and software technologies, like “Smart Parts” and “Smart Forms”, have the potential to make a significant contribution to improving the support provided to the “key players” actively involved in the MICAP process. In addition to leveraging on these type technologies, a common interface and architecture is needed to “tie together” essential MICAP information that is not currently accessible through one system. Currently, certain information that the MICAP specialist, Production Supervisor, LG, etc., might need to do their job is distributed among several USAF and contractor systems such as FEDLOG/D043, SBSS, D035A, FedEx, etc. Even though the information may reside in one or more of these systems, there is no way for a user to *rapidly* access these systems from a common interface and extract the information needed to perform their respective jobs in an effective and efficient manner.

Information systems technologies will play an important role in the success of the Air Force transition from a “Just in Case” to a more robust “Just-in- Time” inventory management philosophy prescribed by programs like “Lean Logistics”. In addition, initiatives such as the Execution and Prioritization of Repair Support System (EXPRESS), and Readiness Based Leveling (RBL) could significantly change the strategy and techniques used to determine and apportion spares throughout the Air Force. These initiatives will undoubtedly put new demands on personnel and systems that work and support the MICAP process on a daily basis. Hence, it will be important for the Air Force to look ahead and leverage on key technologies that can be integrated in a manner that not only improves the efficiency and effectiveness of the MICAP process, but more importantly, provides users what they need, when they need it, in the format in which they want it.

APPENDIX 1. ACRONYMS

AFMC	Air Force Materiel Command
ALC	Air Logistics Center
AMARC	Aerospace Maintenance and Regeneration Center
CAMS	Core Automated Maintenance System (G054)
CMOS	Cargo Movement Operations System (D132)
DESEX	Defense Emergency Supply Expert System
DIFM	Due-In From Maintenance
DLA	Defense Logistics Agency
DRMS	Defense Reutilization and Marketing Service
EXPRESS	Execution and Prioritization of Repair Support System
FMC	Fully Mission Capable
ILS	Inventory Locator Service
IMWRP	Item Manager Wholesale Requisition Process (D035A)
IRIS	Interrogation Requirements Information System
IRSP	In-Place Readiness Spares Package
MAJCOM	Major Command
MASS	MICAP Asset Sourcing System
MDS	Mission/Design/Series
MESL	Mission Essential Systems List
MICAP	Mission Capability (referenced in some literature as “Mission Impaired Capability Awaiting Parts”)
MIICS	Master Item Identification System (D043)
MOCC	Maintenance Operations Control Center
MRSP	Materiel Readiness Spares Package
MSL	Maintenance-Supply Liaison
MSK	Mission Support Kit
NHA	Next Higher Assembly
NMCM	Not Mission Capable Maintenance
NMCS	Not Mission Capable Supply
MC	Mission Capable
PNMCS	Partially Not Mission Capable Supply
PNMCM	Partially Not Mission Capable Maintenance
RBL	Readiness Based Leveling
SBSS	Standard Base Supply System (D002A)
SOS	Source of Supply
TCN	Transportation Control Number
TCTO	Time Compliance Technical Order
UJC	Urgency Justification Code

APPENDIX 2. AF FORM 2005 KEY DATA ELEMENTS

Document Number	Includes Activity Code, Organization Code, Shop Code, Julian Date, and last four characters of aircraft or part Serial Number
Name of Requesting Individual	
Phone Number	
Delivery Destination	
Part Number	
Manufacturer	Designate by name or CAGE Code
Stock Number	
Nomenclature	
Technical Order (T.O.) Reference	To include T.O. Figure and Index
Quantity	
Unit of Issue	
Urgency Justification Code (UJC)	1A-Not Mission Capable; JA-Partially Mission Capable
Supply Response Priority	

APPENDIX 3. SAMPLE MICAP CHECKLIST

17225/1155

MICAP NEW ADD CHECKLIST

DOCUMENT #:	STOCK #:								
J829FF 7218 0064		6110 000908394							
QTY:	1EA	UIC:	1A	MARK FOR:	72AF129	SRD:	ANZ	DEL DEST:	293
NOUN:	REGULATOR			PART #:	21B30-5A		WUC:	4220A	
POC:	HARRIS			EXT:	5414				

RESEARCH INFORMATION

ERRC:	DEPOT:	TO FIGURE & INDEX:	
X02	X73 F02	4-4 F73 14	
SUB NSN/ISG:	6110 009379245	AUTH QTY:	
6110 008788972 6110 004023519		1	
SUPPLY PT DETAILS:	NO	NEXT HIGHER ASSY:	
RSP/MSK DETAILS:	NO	PBR & REPAIR SHOP:	
DIFM DETAILS:	ITSELF	FEDLOG:	
BENCH STOCK DETAILS:	NO	LOCAL MAN:	GOLD FLAG:
AMARC:	DRMS:	MANUFACTURER:	

CANNIBALIZATION INFORMATION

SEQUENCE #:	JOB CONTROL #:
8/101	972189214
CANN FROM:	CANN TO:
72AF129	72AF151
DATE/TIME CANN:	NEW DEL DEST:
7218/1500	
CALLED IN BY:	DATE/TIME:
HARRIS	7218/1500
PROCESSED BY:	ENTERED IN CANN LOG:
10	YES

MASS INFORMATION

DUE-OUT LOADED IN MASS:	SOURCING:
Y	YES
SPR PROCESSED:	STATUS ENTERED:
72189214	BB
UPDATE BULLET/COMMENT:	CAUSE CODE:
	H
MOCC NOTIFIED:	DATE/START TIME:
Y/H	7218/1530
IM'S NAME:	1 ST REMARKS:
SHERI MORTENSON	ADP TO Depot 4/15. No Good End Date
IM'S #:	FOLLOW-UP:
777-7244	This Time.

APPENDIX 4. "ENABLING" TECHNOLOGIES

- **Scheduling Aids**

Scheduling aids have been developed based on a system of genetic algorithms. The algorithm is "genetic" in the sense that it evolves toward an optimal schedule over repeated tries. Modifications of a particular variable are pursued further if they improve the outcome and are dropped if they do not. Scheduling aids can help to answer questions about the impact of different options (e.g., cannibalization vs. waiting for a part) on scheduled missions.

- **Web Technology**

World Wide Web (WWW) technologies allow for the creation of Internet sites that support textual information, photos, audio-video clips, and sound bites. It was originally developed to enable the sharing of scientific data at remote sites, but is rapidly becoming a household word. A web browser, with the hypertext capability provided by the Hypertext Marking Language (HTML), makes it possible to traverse from one site to another at the click of a mouse. A standard protocol (HTTP) allows different browsers running on different platforms to display the same page in a similar manner. Most browsers include an email interface for messaging. At the click of a mouse, a pre-addressed form appears, ready to be filled out and posted. Web sites can be made secure so that access is limited to authorized personnel.

- **Federated System**

This is an organizational architecture that creates a system of systems. In a Federated System, rather than modifying individual systems to allow them to communicate with each other, the developers acknowledge and understand the differences among the component systems and design an interoperability protocol that takes account of those differences.

- **Personal Data Assistant (PDA)**

A wireless hand-held computer that stores information needed by an individual. It has one or more data input modes, such as a keyboard or stylus, and has a display, usually visual, that can present information to its user. Typically a PDA has a means for transferring data to and from a desk-top computer, either by infrared signals or docking device connected to the computer.

APPENDIX 5. SAMPLE MICAP STATUS BOARD

MASS Printout

Printed on: 18 Aug 1997 at 2221:33

MICAP BOARD Display

<u>SRD</u>	<u>SER-NBR</u>	<u>Stock Number</u>	<u>Document Nbr</u>	<u>Qty</u>	<u>Reqn Nbr</u>	<u>UJC</u>	<u>Stat</u>	<u>Date</u>	<u>SOS</u>	<u>ERC</u>
<u>WUC</u>	<u>Cause</u>	<u>Commodity</u>	<u>Suffix</u>	<u>Nomenclature</u>						
AHL	85A0817	4820ND040641F	J416MB72278605	00001	72279002	1A	BA	97230	FFX	XD1
	46	H			P20J2080-2PMP-APU					
<u>Bullet:</u>	ASSETS AVAIL...EDD 19 AUG...ON TRUCK.....18 AUG/MLG									
XT2	00E1340	2840009119484RX	J470ES72020034	00001	72029053	1M	BB	97232	FPZ	XD1
	23CAA	H			CASE TURBINE ROTOR					
<u>Bullet:</u>	GENERAL ELECTRIC IS THE MANUFACTOR SEE COMMENTS.EDD 31 AUG.AE									
AAW	0000P38	1560008634491	J470SA72270039	00001	72279050	1A	BA	97230	DNK	XF3
	11	K			CANOPY,FIXED T38					
<u>Bullet:</u>	AOA TO JLS (DNK) EDD 18 AUG. EHB 15 AUG									
XT4	00E2062	2840009119484RX	J472ES71920057	00001	71929052	1M	BB	97196	FPZ	XD1
	23CAA	H			CASE TURBINE ROTOR					
<u>Bullet:</u>	THE MANUFACTOR FOR THIS ITEM IS GENERAL ELECTRIC SEE COMMENTS.AE									
XT2	00E2685	2840009119484RX	J472ES72110035	00001	72119051	1M	BB	97274	FPZ	XD2
	2323	H			CASE TURBINE ROTOR					
<u>Bullet:</u>	GENERAL ELECTRIC IS THE MANUFACTOR SEE COMMENTS EDD 31 AUG.									
XN3	00E0783	4320004682031PL	J511ES72250078	00001	72259040	1M	BB	97229	FHZ	XD2
	2353M	H			PUMP 639E687P01					
<u>Bullet:</u>	AOA TO DEPOT NO GOOD EDD AT THIS TIME. JCO AUG.13									
XN3	00E6141	6115009031256BF	J511ES72300008	00001	72300130	1M	BA	97235	FGZ	XD2
	42	H			GENERATOR					
<u>Bullet:</u>	AOA TO DEPOT . EDD 23 AUG. MMY 18 AUG.									
AFT	75AA629	5841005072656BF	J512SE71990073	00001	71990462	JA	BB	97232	FHZ	XD2
	74	H			P TRANSMIT 635R640G					
<u>Bullet:</u>	AOA TO DEPOT EDD 31 AUG. JCO AUG. 5 SEE COMMENTS.									
XT2	00E1617	2840009119484RX	J513ES71560045	00001	71569051	1M	BB	97160	FPZ	XD2
	23	H			CASE TURBINE ROTOR					
<u>Bullet:</u>	GENERAL ELECTRIC IS THE MANUFACTOR, SEE COMMENTS EDD 31 AUG.AE									
XT4	00E1302	2840012845407RX	J513ES71710040	00001	71719050	1M	BB	97175	FPZ	XD2
	23	H			CASE TURBINE J85					
<u>Bullet:</u>	GENERAL ELECTRIC IS THE MANUFACTOR FOR THIS ITEM SEE COMMENT.AE									
G6A	00GBL47	2530014399807	J719RL71340017	00001	71349076	1G	BV	97296	S9C	XB3
	AG	A			SECTOR,STEERING					
<u>Bullet:</u>	CONTRACT HAS BEEN AWARDED STILL AWAITING NEW EDD.AE 13 AUG									
GV7	00GHP41	4720014262330	J719RL71670068	00001	71679077	1G	BV	97245	S9C	XB3
	AG	A			HOSE ASSEMBLY,NONME					
<u>Bullet:</u>	CONTRACTOR WILL SHIP DIRECTLY TO US ESD 3 SEPT.AE 13 AUG.									
GYK	00GBL45	533000572028	J719RL72250019	00006	72259075	1G	BA	97227	NNZ	XB3
	22300	A			O-RING					
<u>Bullet:</u>	AOA TO DEPOT EDD 20 AUG.AE 13 AUG									
G5X	00GAC82	5935P63052-100	J732AG72260005	00001	???????	1G	Cancelled			XB3
	ZZ	A			SPARKSHIELD					
<u>Bullet:</u>	JBB PART...HAVE TO WAIT UNTIL MONDAY..P 97T3901.....15 AUG/MLG									